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                                                                   Docket RAL919990140US1

Amendments to the Claims:

1. (Currently amended) A method for determining a longest prefix match for a variable
   length search key by a computer processing device, comprising ~~the acts of~~:

   reading an input key as a search string;

   using the N most significant bits of the input key as an address to index into
   a table representing a plurality of root nodes of search trees wherein
   each non-empty entry contains a pointer to a next branch in the
   search tree or a leaf;

   determining if the pointer in a non-empty table entry points to a leaf or a next
   branch of the corresponding search tree;

   reading the next branch contents if the pointer does not point to the leaf of
   the corresponding search tree and comparing the prefix represented
   by the next branch with the input key to find a distinguishing bit
   position;

   reading a leaf pattern when the leaf of a corresponding search tree is
   reached and comparing the leaf pattern with the input key to
   determine if the leaf pattern matches the input key; and

   returning the longest prefix match found for the input key to a requesting
   application.

2.   (original) The method for determining the longest prefix match of claim 1 wherein
       the table representing a plurality of root nodes of search trees contains 2^N entries.

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3.   (original) The method for determining the longest prefix match of claim 1 wherein the computer processing device is a network processor.

4.   (original) The method for determining the longest prefix match of claim 1 wherein the contents of the next branch of the corresponding search tree points to another next branch.

5.   (original) The method for determining the longest prefix match of claim 1 wherein the contents of the next branch points to the leaf of the corresponding search tree.

6.   (original) The method for determining the longest prefix match of claim 1 wherein the contents of the next branch points to both a bird and to another next branch of the corresponding search tree.

7.   (original) The method for determining the longest prefix match of claim 6 wherein the bird represents a special type of leaf that represents a partial prefix match of the input key.

8.   (original) The method for determining the longest prefix match of claim 7 wherein the bird is placed on a bird stack along with an associated bit position.

9.   (original) The method for determining the longest prefix match of claim 8 further comprising testing the bird stack to determine if it is full.

10.   (original) The method for determining the longest prefix match of claim 9 further comprising, if the bird stack is not full, reading the contents of the next branch of the corresponding search tree.

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11.   (original) The method for determining the longest prefix match of claim 9 further
       comprising, if the bird stack is full, flushing the bird stack.

12.   (Currently amended) The method for determining the longest prefix match of claim
       11 wherein ~~the act of~~ flushing the bird stack comprises the acts of:
              reading the contents of the birds from a memory location;
              comparing the input key with the pattern stored in the contents of the
                     bird memory location;
              determining a distinguishing position which represents a first bit at
                     which the bird pattern and the input key differ;
              selecting the bird with the largest bit number that does not exceed
                     the distinguishing position to keep in the bird stack; and
              removing all other birds in the bird stack.

13.   (Currently amended) The method for determining the longest prefix match of claim
       1 further comprising ~~the act of~~ terminating the search for the longest prefix match
       when the bit number of the next branch exceeds the length of the input key.

14.   (Currently amended) A computer readable medium containing a plurality of data
       structures for finding a longest prefix match for a variable length search key,
       comprising:
              ~~a pattern or~~ an input key that is to be searched;
              a direct table that stores a first address location for a search tree;
              a plurality of pattern search control blocks that each represent a
                     branch in the search tree;
              at least one bird representing a partial match of the input key; and
              a plurality of leaves wherein each leaf is an address location for the
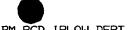
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result of a search.

15. (original) The computer readable medium containing a plurality of data structures for finding the longest prefix match of claim 14 further comprising a lookup definition table that manages a tree search memory.

16. (original) The computer readable medium containing a plurality of data structures for finding the longest prefix match of claim 15 wherein the lookup definition table comprises entries that define a physical memory that the tree resides in, a size of the key and leaf, and a type of search to be performed.

17. (Currently amended) The computer readable medium containing a plurality of data structures for finding the longest prefix match of claim [[14]] 15 wherein the lookup definition table is implemented in a plurality of memories.

18. (original) The computer readable medium containing a plurality of data structures for finding the longest prefix match of claim 14 wherein a format for a direct table entry includes at least one of a search control block; a next pattern address that point to a next pattern search control block; a leaf control block address that points to a leaf or result; a next bit or bits to test; and a direct leaf.

19. (original) The computer readable medium containing a plurality of data structures for finding the longest prefix match of claim 14 wherein a format for a pattern search control block includes at least one of a search control block; a next pattern address that point to a next pattern search control block; a leaf control block address that points to a leaf or result; and a next bit or bits to test.

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20.   (original) The computer readable medium containing a plurality of data structures for finding the longest prefix match of claim 14 wherein a leaf data structure includes at least one of a leaf chaining pointer; a prefix length; a pattern to be compared to the search key; and variable user data.

21.   (original) The computer readable medium containing a plurality of data structures for finding the longest prefix match of claim 18 wherein the direct leaf is stored directly in a direct table entry and includes a search control block and a pattern to be compared to a search key.

22.   (original) The computer readable medium containing a plurality of data structures for finding the longest prefix match of claim 14 wherein a pattern search control block is inserted in the search tree at a position where the leaf patterns differ.

23.   (original) The computer readable medium containing a plurality of data structures for finding the longest prefix match of claim 14 wherein a pattern search control block has a shape defined by a width of one and a height of one and is stored in a memory that has a line length of at least 64 bits.

24.   (original) The computer readable medium containing a plurality of data structures for finding the longest prefix match of claim 14 wherein a pattern search control block has a shape defined by a width of one and a height of two and is stored in a memory of at least 36 bits.

25-34. (canceled without prejudice)

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35.   (previously presented) A computer readable medium containing a program product for determining a longest prefix match for a variable length search key, comprising:

      program instructions that read an input key as a search string;

      program instructions that use the N most significant bits of the input key as an address to index into a table representing a plurality of root nodes of search trees wherein each non-empty entry contains a pointer to a next branch in the search tree or a leaf;

      program instructions that determine if the pointer in a non-empty table entry points to a leaf or a next branch of the corresponding search tree;

      program instructions that read the next branch contents if the pointer does not point to the leaf of the corresponding search tree and compare the prefix represented by the next branch with the input key to find a distinguishing bit position;

      program instructions that read a leaf pattern when the leaf of a corresponding search tree is reached and compare the leaf pattern with the input key to determine if the leaf pattern matches the input key; and

      program instructions that return the longest prefix match found for the input key to the requesting application.

36.   (original) The computer program product for determining the longest prefix match of claim 35 wherein the table representing a plurality of root nodes of search trees contains 2^N entries.

37.   (original) The computer program product for determining the longest prefix match of claim 35 wherein the contents of the next branch of the corresponding search tree

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points to another next branch.

38.   (original) The computer program product for determining the longest prefix match
       of claim 35 wherein the contents of the next branch points to the leaf of the
       corresponding search tree.

39.   (original) The computer program product for determining the longest prefix match
       of claim 35 wherein the contents of the next branch points to both a bird and to
       another next branch of the corresponding search tree.

40.   (original) The computer program product for determining the longest prefix match
       of claim 39 wherein the bird represents a special type of leaf that is in the middle of
       a search tree branch.

41.   (original) The computer program product for determining the longest prefix match
       of claim 40 wherein the bird is placed on a bird stack along with an associated bit
       position.

42.   (original) The computer program product for determining the longest prefix match
       of claim 41 further comprising program instructions that test the bird stack to
       determine if it is full.

43.   (original) The computer program product for determining the longest prefix match
       of claim 42 further comprising program instructions that read the contents of the next
       branch of the corresponding search tree if the bird stack is not full.

44.   (original) The computer program product for determining the longest prefix match

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of claim 42 further comprising program instructions that flush the bird stack if the
bird stack is full.

45.   (original) The computer program product for determining the longest prefix match
        of claim 44 wherein the act of program instructions that flush the bird stack
        comprises:

                        program instructions that read the contents of the birds from a
                                memory location;

                        program instructions that compare the hashed key with the pattern
                                stored in the contents of the bird memory location;

                        program instructions that determine a distinguishing position which
                                represents a first bit at which the bird pattern and the hashed
                                key differ;

                        program instructions that select the bird with the largest bit number
                                that does not exceed the distinguishing position to keep in the
                                bird stack; and

                        program instructions that remove all other birds in the bird stack.

46.   (original) The computer program product for determining the longest prefix match
        of claim 35 further comprising program instructions that terminate the search for the
        longest prefix match when the bit number of the next branch exceeds the length of
        the hashed key.

47.   (Currently amended) A method for determining a longest prefix match for a variable
        length search key by a computer processing device, comprising the acts of:
                        reading an input key as a search string;

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using N bits of the input key as an address to access a table representing

a plurality of root nodes of search trees wherein each non-empty entry contains a

pointer;

determining if the pointer in a non-empty table entry points to at least a leaf

of the corresponding search tree;

reading a leaf pattern in the leaf;

comparing the leaf pattern with the input key, to determine if the leaf pattern

matches the input key, only if the leaf is an end leaf; and

returning the leaf pattern as the longest prefix match found for the input key

to a requesting application only if there is an exact match between the leaf pattern

and the input key.

48.   (Currently amended)   The method of claim 47 further including the acts of:

storing the leaf pattern in a stack if the leaf is not the end leaf of the

corresponding tree;

determining other leaves, if any, that are not end leaves of the corresponding

tree; and

storing leaf patterns associated with each one of the other leaves in the

stack.

49.   (Currently amended) The method of claim 48 further including the acts of retracing

a path laid out between the end leaf, other leaves and root node of the

corresponding tree to determine the longest prefix match if the leaf pattern in the

end leaf does not exactly match the input key.

50.   (Currently amended) The method of claim 49 wherein the retracing act includes

correlating the input key with the leaf pattern in the end leaf to determine a

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distinguishing bit position;

    using the distinguishing bit position to access the stack; and

    selecting one of the entries thereon as the longest prefix match found for
said input key.

51. (Currently amended) A method for determining a longest prefix match for a variable
length search key by a computer processing device, comprising ~~the acts of~~:

(a)   reading an input key as a search string;

(b)   using the N most significant bits of the input key as an address to index into
a table representing a plurality of root nodes of search trees wherein each
non-empty entry contains a pointer to a next branch in the search tree or a
leaf;

(c)   determining if the pointer in a non-empty table entry points to a leaf or a next
branch of the corresponding search tree;

(d)   reading the next branch contents if the pointer does not point to a leaf of the
corresponding search tree;

(e)   repeating acts (c) and (d) until a leaf is reached;

    reading a leaf pattern when the leaf of a corresponding search tree is
reached and comparing the leaf pattern with the input key to determine if the
leaf pattern matches the input key; and

    returning the leaf pattern as the longest prefix match found for the input key
to a requesting application.

52-59.   (canceled without prejudice)

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